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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Rulemaking to amend the Commission's Rules to Establish Part 27, the Wireless Communications Service ("WCS")	)	GN Docket No. 96-228
	)	

DOCKET FILE COPY ORIGINAL

TO: The Commission

MOTION FOR ACCEPTANCE OF LATE FILED COMMENTS

The Satellite Industry Association ("SIA") respectfully requests that the Commission accept the attached comments as timely filed. Comments are being filed one day late due to the unfortunate timing of the SIA's board of directors meeting on the filing date of December 4, 1996. There should be no harm to any parties from accepting these comments at this time.

Respectfully submitted,

The Satellite Industry Association

Clayton Mowry, Director
Lon Levin, Chair, Spectrum Working Group
Satellite Industry Association
225 Reinekers Lane, Suite 600
Alexandria, VA 22314
(703)549-8697

December 5, 1996

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TO: The Commission

COMMENTS OF THE SATELLITE INDUSTRY ASSOCIATION

The Satellite Industry Association ("SIA") hereby submits comments on the Notice of Proposed Rulemaking ("NPRM") regarding the Commission's intention to establish new Wireless Communications Services ("WCS") in the 2305-2320 and 2345-2360 MHz bands. It is important for the Commission to recognize that the spectrum allocated for WCS is far more likely to be used for terrestrial services than for satellite services, despite the advantages that satellites provide in serving low-density areas. The basic characteristics of satellite technology place satellite DARS applicants at a disadvantage in competing against terrestrial services for the same spectrum. Therefore, SIA encourages the Commission to seek adequate spectrum for competing satellite DARS services and to avoid creating mutual exclusivity among existing applicants.

SIA is a national trade association formed in the Spring of 1995 by several leading U.S. satellite manufacturers, service providers and launch service companies.[1] SIA was established to serve as an advocate for the U.S. commercial satellite industry on regulatory and policy issues common to its members. With 21 current executive member companies providing a broad range of the manufactured products and services, SIA represents the unified voice of the U.S. commercial satellite industry.

SIA's opposition to the use of auctions to allocate or license spectrum has been provided in previous comments, letters, and reports to the Commission over the past year.[2] SIA strongly opposes the use of auctions for satellites because of the regional and international nature of our industry. Spectrum auctions raise several highly troubling issues for satellite services including the likelihood that auctions in the U.S. will lead to sequential auctions in countries around the world. Thus, for instance, a satellite DARS operator that had to acquire its U.S. license at auction might face further and inefficient auctions to use the spectrum outside the United States. Proof of sequential auctions resides in several recent proposals by foreign regulatory bodies to auction satellite spectrum in the wake of a U.S. auction for direct broadcast services ("DBS") that have already created a risky and uncertain

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[1] SIA's executive members are: American Mobile Satellite Corp., AT&T SKYNET Satellite Services, Arianespace Inc., Boeing Commercial Space Company, COMSAT Inc., CTA Inc., GE American Communications Inc., Global Access Telecommunications Services Inc., Globalstar LP, Hughes Communications Inc., ICG Satellite Services Inc., Iridium LLC, Keystone Communications Inc., Lockheed Martin Corp., Motorola SSTG, Orbital Sciences Corp., Orion Network Services Inc., PanAmSat Corp., Space Systems/LORAL Corp., Teledesic Corp., and TRW/Odyssey Services Organization. The SIA is an operating entity of the Satellite Broadcasting and Communications Association ("SBCA").

[2] SIA Comments in the NPRM, Rulemaking to Amend Parts 1,2,21, and 25 to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, FCC CC Docket No. 92-297. Letter to International Bureau Chief and attached Strategic Policy Research Study, submitted to the Commission on March 21, 1996. SIA Comments on Spectrum Policy presented at the at the Commission's En Banc Hearing, February 28, 1996.

environment for U.S. satellite companies in overseas markets.

The Commission's proposal in the WCS NPRM, however, goes beyond mere auctions for satellite licenses by using competitive bidding to allocate spectrum to different types of wireless services. The NPRM would allow winning bidders to provide any fixed, mobile, radiolocation or satellite DARS wireless service, effectively pitting terrestrial applicants against satellite applicants. In such an auction satellite DARS applicants would not compete on a level playing field against terrestrial wireless applicants.

Competing for a satellite DARS authorization in the WCS auction will be difficult because the bidder does not know at the time it is bidding the extent to which the U.S. will be able to successfully coordinate the use of the spectrum with foreign administrations that may be affected. The 2303-2320 and 2345-2360 MHz spectrum is likely to require such international frequency coordination before it can be used by a satellite system.

Another substantial problem for a satellite bidder to overcome is the need to acquire a complete, national block of spectrum. When bidding for spectrum in multiple round auctions against many terrestrial wireless services, satellite DARS face the uncertainty of not winning every auction and subsequently being unable to launch a national service. If the Commission decides to hold 5 regional auctions or 51 Major Trading Area ("MTA") auctions, a prospective satellite service provider must win all the auctions to avoid interference from terrestrial wireless service providers.

It is also apparent that, when satellite systems are required to bid against terrestrial systems for spectrum, the inherent benefit of satellites in providing universal, low-density service is not likely to translate into a higher competitive bid. In an urbanized society such as the United States, there will frequently be more profit in using spectrum for terrestrial technology to provide service to metropolitan areas than in using the same spectrum for satellite technology that can provide similar services around the entire country. Satellite technology, however, provides the significant benefit, recognized by the Communications Act, of nation-wide service, accessible to urban and rural areas alike. Head-to-head auctions between terrestrial and satellite systems fail to recognize this benefit.

The drive to increase revenues from auctions for government appropriations should not run contrary to the Commission's obligation to promote the development and deployment of new technologies, products, and services that benefit the public, including those in rural areas. SIA supports the Commission's past work to engender new satellite technologies that serve rural and urban America alike, without resorting to spectrum auctions to license such services.

In addition to opposing spectrum auctions for satellite services, the SIA also strongly encourages the Commission to provide sufficient spectrum to satellite DARS applicants and to avoid creating a mutually exclusive situation by allocating adjacent spectrum to more profitable services. SIA supports the Commission's continued work in the DARS and other proceedings to avoid situations of mutual exclusivity by expanding available spectrum, encouraging sharing, and promoting the use of more efficient technologies.

Respectfully submitted,

The Satellite Industry Association

Clayton Mowry, Director
Lon Levin, Chair, Spectrum Working Group
Satellite Industry Association
225 Reinekers Lane, Suite 600
Alexandria, VA 22314
(703)549-8697

December 5, 1996

SIA SATELLITE INDUSTRY ASSOCIATION

Executive Member Companies

American Mobile Satellite Corp.
Arianespace, Inc.
AT&T SKYNET Satellite Services
Boeing Commercial Space Co.
COMSAT Corp.
CTA, Inc.
GE American Communications, Inc.
Global Access, Inc.
Globalstar
Hughes Communications, Inc.
ICG Satellite Services, Inc.
Iridium, Inc.
Keystone Communications Corp.
Lockheed Martin Corp.
Orbital Sciences Corp.
Orion Network Systems, Inc.
PanAmSat Corp.
Space Systems/LORAL
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An Operating Entity of the Satellite Broadcasting and Communications Association

March 21, 1996

Scott Blake Harris, Chief
International Bureau
Federal Communications Commission
Washington, DC 20554

Dear Mr. Harris:

Enclosed is Strategic Policy Research's study of satellite spectrum auctions. The SPR study provides a rigorous policy analysis of the consequences to the public of satellite spectrum auctions.

The study's conclusions are highly troubling. These include the following unique harmful consequences:

- Satellite operators will face sequential auctions as one country or region after another conducts its own auction or imposes auction-based fees for the right to operate in its territory. Sequential auctions will add incalculable cost and risk to deployment of new satellite systems and are likely to lead to extortion of U.S. satellite companies by foreign governments.

- As an alternative to sequential auctions, countries may push for increased *a priori* planning of satellite spectrum or for global auctions. These outcomes would result in inefficient use of the spectrum/orbit resource and reduce the U.S. government's leadership role.

- Revenues that other countries would collect from auctions or from charging auction-based fees are likely to be several times larger than whatever auction revenue is collected by the U.S. Treasury. **This means a huge outflow of U.S. dollars and a net loss to the U.S. Treasury.**

- To avoid the threat of U.S. auctions, U.S. satellite operators may look to foreign administrations for sponsorship, which will lead to the U.S. ceding regulatory and policy leadership to other administrations or to the ITU.

- The cumulative effect of auctions is likely to be a significant reduction in the deployment of new regional and global satellite systems that would otherwise produce tens of thousands of high-paying U.S. jobs and billions of dollars in U.S. exports.

- Any use of auctions for satellite licenses will undermine the historically successful ability of the Commission to find ways to accommodate reasonable satellite applicants.

We urge you to give this study your close attention. We welcome an opportunity to discuss it further with you and your staff.

Very truly yours,

Lon C. Levin
Executive Board Member

Public Harms Unique to Satellite Spectrum Auctions

STRATEGIC
POLICY
RESEARCH

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PUBLIC HARMS UNIQUE TO SATELLITE SPECTRUM AUCTIONS

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A STUDY PREPARED FOR THE
SATELLITE INDUSTRY ASSOCIATION

MARCH 18, 1996

* Jackson, Haring, Shooshan and Rohlfs are principals in Strategic Policy Research, Inc., an economics and telecommunications policy consulting firm located in Bethesda, Maryland. Dr. Jackson was formerly Staff Engineer with the House Telecommunications Subcommittee and engineering assistant to FCC Commissioner Glen O. Robinson. Dr. Haring formerly served as Chief Economist and Chief, Office of Plans and Policy, at the Federal Communications Commission. Mr. Shooshan formerly served as Chief Counsel and Staff Director for what is now the Subcommittee on Telecommunications, U.S. House of Representatives. Dr. Rohlfs formerly served as Head of Economic Modeling Research at Bell Labs. Ms. Pehrsson is a Senior Consultant at SPR.

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March 18, 1996

Background

After decades of discussion, in 1993, Congress authorized the Commission to use competitive bidding systems (including auctions) to decide among mutually exclusive applications. Congressional action was in large part driven by budget considerations. The FCC has conducted several such auctions and has indicated a strong predisposition to auction radio licenses wherever possible. Are auctions for every radio license appropriate? If not, when are auctions appropriate? When are they not appropriate? This paper considers these general questions and then goes on to consider the specific question of whether auctions are appropriate for satellite systems, especially given the history of the FCC's successful satellite licensing efforts and the fact that operation of satellite systems involves a complex set of international regulations and technical coordination.

Auctions are a way of choosing the licensee when there are more qualified applicants than licenses available. Thus, in radio services where applicants do not exceed available licenses, auctions are not needed (and will not produce any revenues). For radio licenses that do not provide exclusivity (aeronautical mobile, CB, amateur), an auction, or any other selection mechanism, is obviously inappropriate. Where scarcity exists and exclusivity is offered, auctions are one of several alternative ways of choosing radio licensees from among mutually exclusive applicants. Other methods include comparative hearings and lotteries, both of which have been the subject of considerable criticism. While each of these approaches has its advantages and disadvantages, the task for the FCC is to determine the approach that best serves the public interest given the totality of the circumstances affecting a particular service.

Until its recent decision to auction two direct broadcast satellite (DBS) orbital locations in admittedly unique circumstances, the FCC had avoided the need to use *any* of these selection mechanisms to choose among potential satellite licensees. Rather, the FCC had used the combination of strict eligibility requirements, more efficient technical rules (*e.g.*, reduced orbital spacing), and expanded frequency bands to accommodate growth in the satellite industry. The Commission has taken steps to avoid scarcity and thereby has obviated the need to choose among competing applicants. As a result, the industry has adopted new technologies that permit more satellites to operate. These efficiency improvements have paid great dividends in terms of services to consumers and in terms of job creation within the satellite industry.

Benefits from Satellites

As a result of the steps taken by the FCC and the satellite industry, the U.S. economy has benefited substantially. These benefits include:

- $5.8 billion of productive output (in 1994 alone);
- Supporting 26,000 direct jobs in 1994; and
- Approximately $1 billion per year in exports of commercial satellites.

The U.S. satellite industry is extremely dynamic and promises to continue to grow in the next few years, perhaps to several times its present size, with much of the growth in regional and international markets. U.S. companies have historically been very innovative in developing new services. In recent years, they have expanded greatly the use of satellites for regional and international services. In the future, newly-licensed Mobile Satellite Service systems and proposed Fixed Satellite Service systems in the Ka-band stand to provide even more new services and to open additional international markets. Similarly, Digital Audio Radio Service (DARS) transmitted from satellites will provide new listening opportunities for consumers.

Effective Policy Tools

The FCC's track record in accommodating this dynamic industry has been a great accomplishment, albeit one that has not received the attention afforded budget deficit-reducing spectrum auctions. The combined efforts of the satellite industry and the FCC have substantially expanded satellite capacity and provided an environment that has promoted technological advancement. There has been substantial growth in both in-orbit satellite capacity and spectrum available for fixed satellite service. This vast growth has been accommodated through a combination of technological advance and more efficient use of spectrum.

The FCC has several policy tools that it has used successfully in the past. They include:

- Encouraging better technology;
- Expanding the spectrum available to satellite systems;
- Imposing due diligence milestone requirements on licensees and other policies to deter speculation and warehousing;
- Authorizing multiple systems using a "build and coordinate" rule as was done in LEO MSS; and
- Authorizing shared platforms (as was done in DBS).

A critical factor setting satellite communications systems apart from most other major radio communications systems is their greater international scope. With today's technology, a geostationary satellite within the arc that affords U.S. coverage almost inevitably serves significant portions of Mexico, Canada and the Caribbean, and geostationary satellites outside that arc carry voice, video and data signals between the U.S. and numerous overseas locations. The newer low-earth orbit satellite systems (LEOs) are inherently global and create even clearer international impacts.

Consequently, regulation of satellite systems has important international dimensions, and regulatory processes in this country have significant international repercussions. The U.S. approach to satellite regulation has served as a model for many other countries. The use of auctions could make it virtually impossible for the U.S. to forestall the use of auctions or the levying of spectrum fees by other nations on these same systems. Such auctions and fees could, in turn, substantially harm U.S. interests. Auctions could end up benefiting taxpayers in other countries more than taxpayers in the U.S. The revenues that other countries would collect from auctions or from charging fees that correlate to auction prices paid elsewhere are likely to be several times larger than whatever auction revenue is collected by the U.S. Treasury; this means a huge outflow of U.S. dollars and likely a complete offset of the auction revenue collected by the U.S. Treasury. In the event of a global auction conducted by some international regulatory body, the result may be restricted spectrum supply and loss of U.S. leadership in spectrum planning decisions.

Public Harms

Given its successful history of accommodating entry (*i.e.*, preventing spectrum scarcity from becoming an issue) and in light of the potentially troubling international implications, the FCC needs to carefully consider whether auctions are desirable for awarding satellite spectrum. There are a number of major concerns with the use of auctions in this context. Because of satellite's uniquely international character, satellite auctions raise concerns that extend beyond those traditionally associated with auctions:

- Auctions could undermine the tradition of accommodating entry by moving to more efficient technology (thereby avoiding mutual exclusivity).

- U.S. auctions could precipitate sequential auctions (where one country or region after another conducts its own auction or assesses fees for the right to operate in its territory) or imposition of spectrum fees by other nations. Auctions are inherently inefficient when conducted sequentially for worldwide systems. Also, auctions or fees may prove to be extortionate by design or effect or may impose incalculable costs on the applicants that will cripple or kill their enterprises.

- To increase revenues, individual countries conducting auctions will have an incentive to restrict the supply of satellite spectrum (*e.g.*, warehousing spectrum and orbital resources), implement *a priori* planning and oppose new allocations of satellite spectrum; any of these would dramatically reduce opportunities for U.S. companies and restrict output that would otherwise be available to consumers.

- Consequently, sequential auctions could create cost, delay and uncertainty that would:
  - — Greatly discourage investment in satellite systems;
  - — Deny consumers the economic benefits of new technology and expanded competition;
  - — Impact the economy: Loss of only one of the proposed Ka-band systems due to this additional cost and risk would cost the U.S. economy thousands of job-years and billions of dollars. If all the proposed Ka-band systems were

terminated, the impact on the GDP would be a loss of 370,000 job-years and $60 billion; and

— Reduce American competitiveness.

- Orbital positions are a global resource and belong to the world at large — U.S. auctions would displace and prematurely regulate other countries' regulatory and business satellite policies.

- U.S. auctions would encourage satellite operators to operate under administrations of other countries; the U.S. will cede regulatory leadership to other countries and multinational organizations.

- In the event of global auctions, the regulatory body conducting the auctions may have incentives to structure spectrum supply, spectrum allocation and revenue distribution in a manner less favorable to the U.S.

- Auction revenues in other countries may reduce tax payments to the Federal Government.

Conclusion

Satellite auctions could create substantial harms that outweigh any alleged benefits of administrative efficiency or revenue generation. Precisely because these harms are not immediately apparent and are more long-term in nature, it might be tempting to ignore them in a head-long rush to auctions. Spectrum auctions should be considered only a tool, not an end in themselves. Were production of auction revenues treated as the goal (in fact, the statute authorizing the FCC to auction spectrum states that such treatment is prohibited), it might lead to inefficient restriction of the use and supply of spectrum in order to drive up its price and the resulting auction revenues. The FCC's mandate is to serve the public interest by providing a fair, efficient and equitable radio service, promoting access to telecommunications by U.S. and international consumers. This historically has been accomplished in the satellite sector without any need for auctions. Regulatory decisionmakers should determine why that which has worked in the past cannot continue to work in the future. Given the substantial negative effects of satellite auctions, the FCC should make every effort to avoid such auctions.

There are a variety of alternatives to using auctions for satellite services. Such alternatives should be fully explored and carefully considered. It would be ironic — and unfortunate — if the Commission abandoned its successful past satellite policies and created an artificial spectrum scarcity that then "required" the use of auctions.

Public Harms Unique to Satellite Spectrum Auctions

Strategic Policy Research, Inc.

March 18, 1996

I. Introduction

After decades of discussion, in 1993, spurred by budget considerations, Congress authorized the Commission to use competitive bidding systems (including auctions) to decide among mutually exclusive applications for radio licenses. The FCC has conducted several such auctions and has indicated a strong predisposition to auction radio licenses wherever possible. We believe that spectrum auctions are an efficient administrative tool in appropriate circumstances. However, if auctions become an end in themselves, there may be unfortunate and unintended consequences. For example, the incentive could arise to inefficiently restrict the use and supply of spectrum in order to drive up its price and resulting auction revenues. This outcome would conflict with public-interest obligations and would be at odds with the FCC's clear statutory mandate to provide for a fair, efficient and equitable radio service. Before undertaking any additional satellite auctions, the FCC must determine why that which has worked in the past cannot continue to work in the future. Are auctions for every radio license appropriate? If not, when are auctions appropriate? This paper considers these general questions and then goes on to consider the specific question of whether auctions are appropriate for satellite systems, especially given the history of the FCC's successful satellite licensing efforts.

Before undertaking any additional satellite auctions, the FCC must determine why that which has worked in the past cannot continue to work in the future.

Auctions are a way of choosing the licensee when there are more applicants than licenses available. The FCC historically has taken steps to avoid scarcity in the satellite industry and thereby has obviated the need to choose among competing applicants. Rather, the FCC has used the combination of strict eligibility requirements, more efficient technical rules (*e.g.*, reduced orbital spacing), and expanded frequency bands to accommodate growth in the satellite industry. As a result, the industry has adopted new technologies that permit more satellites to operate. These efficiency improvements have paid great dividends in terms of services to consumers and in terms of job creation within the satellite industry.

The FCC's track record here has been a great accomplishment, albeit one that has not received the attention afforded budget deficit-reducing spectrum auctions. The combined efforts of the satellite industry and the FCC have substantially expanded satellite capacity. There has been substantial growth in both in-orbit satellite capacity and spectrum available for fixed satellite service. Worldwide capacity of operating satellites has increased enormously in the past 30 years. This vast growth has been accommodated through a combination of technological advance and more efficient use of spectrum. In the latter regard, adoption of cross-polarized transmissions and the move from four-degree to two-degree satellite spacing *each* have allowed a doubling of capacity in geostationary C-band services.

The FCC's track record here has been a great accomplishment, albeit one that has not received the attention afforded budget deficit-reducing spectrum auctions.

This study examines the remarkable success of the U.S. satellite industry and considers the potential negative effects of auctions, including their impact on economic growth, jobs and the balance of trade.

II. The U.S. Satellite Industry; An Historical Perspective

The satellite industry is an American success story.

The satellite industry is an American success story. A recent assessment of world space markets[1] found that the U.S. industry is increasing its already large share of the world space market; European manufacturers are finding it difficult to maintain even their minority share of the business. European companies such as Aerospatiale, Matra Marconi Space, Alenia and Deutsche Aerospace have been losing ground to U.S. companies such as Hughes Electronics, Lockheed Martin and Space Systems/ Loral. U.S. satellite manufacturers held 71.8 percent of the committed market's value as of May 1994.[2] The same study concluded that U.S. satellite manufacturers are likely to lead the global market throughout the decade, but predicted that Japanese manufacturers will emerge as full-fledged competitors by the late 1990s. Thus, the U.S. industry will face new competitive challenges in the next several years.

A. Technological Development

. . . the satellite industry has been a technology leader in several markets, including international telephony, television distribution and mobile telephony in rural areas.

The satellite industry has grown rapidly from its inception. In fact, the satellite industry has been a technology leader in several markets, including international telephony, television distribution and mobile telephony in rural areas.

In 1965, the International Telecommunication Satellite Organization (Intelsat) launched *Intelsat I* ("Early Bird") into orbit over the Atlantic Ocean, providing the first continuous transatlantic satellite link. *Intelsat I* was a primitive geostationary satellite which could transmit only either 240 voice circuits or one television signal. A second generation of such spin-stabilized[3] telecommunications spacecraft (*Intelsat II*) were placed into orbit in 1966 and 1967. These satellites used global beams which could reach a much broader portion of the earth than their predecessor. In 1966, the

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1 Euroconsult, *World Space Market Survey* (*see* discussion in "Space Services Market to Reach $95-$115 Billion," *Aviation Week & Space Technology*, August 9, 1994, p. 70).

2 This trend has not gone unnoticed in Europe, and there have been recent efforts by the European Union to address this issue.

3 A technique by which the cylindrical body of the satellite spins around its axis at a fixed rate in order to keep the satellite's antennas correctly oriented for transmitting signals earthward.

Soviet Union became the first country to operate a domestic satellite communications network. The system used four *Molniya* satellites at intervals along the path of an elliptical orbit, instead of geostationary satellites. Intelsat had deployed three *Intelsat III* satellites over the Atlantic, Pacific and Indian Oceans by 1969, yielding a satellite system accessible by almost any location. When Intelsat began deployment of the *Intelsat IV* series in 1971, each spacecraft carried 12 transponders, which collectively could relay an average of 3,750 simultaneous telephone circuits and two television channels. They could broadcast both global beams as well as spot beams which were "steerable" (*i.e.*, could be concentrated over certain areas of the earth's surface).

Canada and the U.S. began domestic satellite programs of their own in the early 1970s.

Canada and the U.S. began domestic satellite programs of their own in the early 1970s. Initial plans for domestic communications satellite service had been announced in 1966 in the U.S. However, regulatory review by the FCC delayed active development until 1972. The 1972 "Open Skies" order permitted any qualified legal entity to construct a satellite system offering specialized services. Meanwhile, the USSR had began operation of the non-geostationary *Molniya*.[4] Canada's *Anik A* series provided the first non-Soviet domestic satellite system in 1972. In the U.S., the "Open Skies" policy stimulated RCA's introduction of the first domestic service in 1973 using leased *Anik A-2* channels. The first U.S. carrier to launch its own satellite was Western Union, which launched *Westar* in 1974. A joint venture between Germany and France deployed experimental *Symphonie* satellites in 1974 and 1975. RCA developed its own *Satcom* series of satellites by 1975, the first satellites domestically or internationally to provide spectrum reuse, using orthogonal antenna polarization to achieve increased channel capacity and more efficient spectrum utilization. This approach was next used by AT&T/Comsat with the 1976 launch of the first large *Comstar*. Indonesia used technology and designs developed by Hughes to become the fourth nation to deploy a domestic communications satellite system with the launch of its first *Palapa* satellite in 1976.

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[4] The *Molniya*'s unique 12-hour elliptical inclined orbit with northern apogee afforded coverage of high latitude areas, though ground antenna tracking and satellite "hand-over" were required.

Sparked by rapid growth of domestic systems based on C-band technology, Ku-band systems were developed. These new systems were motivated by the need for additional spectrum capacity and the economies of smaller earth terminals located at the user site. The first hybrid satellite (using both Ku-band and C-band) was the Canadian *Anik B*, launched in 1978. The first all Ku-band satellite — *SBS* — was launched in 1980. Intelsat began deploying hybrid *Intelsat V* spacecraft in 1980. U.S. domestic satellite service burgeoned in the 1980s. GTE, American Satellite and Hughes joined the competition of RCA/GE Americom, Western Union, AT&T and Satellite Business Systems (SBS). Today, there are an estimated 156 satellites serving the world's nonmilitary communications needs.

B. Evolution of Satellite Services

Satellite technology's accessibility in remote areas, its distance-insensitivity and its rapid deployment capability encouraged use for specialized applications.

Fiber-optic systems eroded some of the earlier satellite business (particularly interexchange telephony), but other services were developed that compensated for that loss. Satellite technology's accessibility in remote areas, its distance-insensitivity and its rapid deployment capability encouraged use for specialized applications. A number of applications involve the use of very small aperture terminals (VSATs). VSAT usage was spurred as customers expanded individual networks by installing VSAT networks for intracorporate data, video and voice communications. VSATs are used particularly heavily for relay of point-of-sale credit authorization and inventory control data among multiple remote locations. Automotive, retail and financial services industries are particularly heavy VSAT users. Estimated revenues from all domestic VSAT *services* (transponder rentals, *etc.*) were over $45 million in 1993, up 25 percent from the prior year. U.S. VSAT *equipment* contracts were valued at about $720 million in 1993. An estimated 103,000 VSAT terminals were installed in the U.S. in 1993, up 28 percent from the previous year.[5]

Originally, North American domestic satellites were used largely for long-distance telephone communications. However, a seminal event for the U.S. satellite

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[5] *U.S. Industrial Outlook 1994* (U.S. Department of Commerce/International Trade Association), p. 30-20.

industry occurred in 1975. Home Box Office (HBO) delivered coverage to the U.S. of a remote world heavyweight boxing match (the "Thrilla in Manila") and other services joined HBO on the GE/RCA Satcom spacecraft soon thereafter. Today, satellites are used by the major television networks to distribute regular programming to affiliates and to transmit special events. Innovators found they could use antennas to receive satellite television programming in their homes. The growth of transistor technology later afforded microwave low-noise amplifiers having low-noise temperatures that permit use of even smaller-sized antennas. The Department of Commerce reported that in 1994, cable television was either transmitted via satellite to more than 11,400 cable headends for terrestrial distribution to 57 million U.S. cable households or beamed directly to 4.1 million viewers with home satellite dishes (television receive-only dishes, or TVROs).[6] To date, TVROs have been used by the end consumer primarily in rural areas not served by cable. In the future, however, TVROs and DBS (direct broadcast satellite) are likely to provide a strong competitor to cable even in areas that *are* served by cable. Use of digital compression technology and high-power Ku-band satellites permit DBS services to offer hundreds of channels that reach satellite dishes as small as 18 inches, which are also considerably less expensive than TVRO dishes. One large DBS service provider — DIRECTV, Inc. — secured 1.2 million subscribers in its first 18 months of operation. Another provider — Primestar — was close behind, reaching 1 million subscribers in January 1996. Industrywide estimates are for over 4.6 million DBS subscribers by the end of 1996.[7]

Use of digital compression technology and high-power Ku-band satellites permit DBS services to offer hundreds of channels that reach satellite dishes as small as 18 inches.

Growth remains steady in fixed satellite services. Satellite service revenue will grow rapidly as newly-introduced DBS and satellite-delivered mobile applications draw larger subscriber bases. Overseas demand for video and business services will expand. In addition to geostationary fixed satellite services, geostationary and low-earth orbiting (LEO) systems providing worldwide personal, portable and mobile telephony and data communications through small satellites will profoundly impact

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6 *Ibid.*, p. 29-15.

7 "DBS: A Minor Headache? Or a Real Pain," *CED*, February 1996, p. 86.

the satellite market. Little LEO (low-earth orbiting) service providers will offer mobile data messaging and position determination services on a global level; Big LEOs will add mobile voice and fax capabilities; Mega LEOs would provide wireless video, voice, and broadband, high-speed data services to small satellite dishes. Proposed Ka-band satellite services include broadband, high-speed digital communications, video, audio, videotelephony and videoconferencing services. The Global Positioning System (GPS), a 24-satellite constellation operated by the U.S. Department of Defense, provides a signal with accuracies of about 100 meters for civilian users in such industries as delivery services, surveying, trucking, nautical navigation and air traffic control. Although GPS signals are available to commercial users free of charge, several U.S. companies provide value-added services to enhance the accuracy of civilian GPS. We should soon see the provision of multiple channels of audio broadcasting service from satellites (DARS). AMSC has gone operational — providing mobile voice communications to all those portions of the U.S. not reached — and those points never to be reached — by cellular and PCS.

The commercial satellite industry has also become increasingly important to defense and research programs. For example, NASA's Tracking and Data Relay Satellite System (TDRSS) was built by and operated by commercial satellite vendors. TDRSS was developed to better support scientific and application mission requirements, and to halt spiraling costs of upgrading and operating a worldwide network of tracking and communication ground stations.

The satellite industry's growth rate greatly exceeds that for the telecommunications industry as a whole, as well as that for the general economy.

C. Contribution to U.S. Economy

The satellite industry's growth rate greatly exceeds that for the telecommunications industry as a whole, as well as that for the general economy. According to U.S. Department of Commerce estimates,[8] U.S. satellite service revenues grew nearly 25 percent, reaching around $2.3 billion in 1994, while telecommunications service revenues rose only 7.7 percent. Preliminary estimates for 1995 are for $2.7

[8] *U.S. Industrial Outlook 1994* (U.S. Department of Commerce/International Trade Association). The following statistics are cited on pp. 30-18 through 30-24 and 29-15 through 29-20.

billion in satellite service revenues. The Department of Commerce predicts that satellite service revenues from both fixed and mobile applications will continue to grow rapidly, fueled by expansion in domestic direct-to-home broadcasting ventures and new international capacity operated by U.S. systems. It also predicts that revenues from emerging mobile and broadcasting applications will compensate for losses to competition from terrestrial communications systems. Finally, it has predicted that industry performance also will benefit from U.S. ventures proposing constellations of smaller LEO satellites for global cellular, messaging and positioning services. NASA reports that U.S. companies operated 32 domsats as of September 1995, carrying 721 total transponders.[9]

The U.S. commercial satellite manufacturing industry had revenues of $2.7 billion in 1993 from production of complete space communications satellite systems. Strong revenue projections for the space segment bolstered steady growth in ground equipment sales and brought total satellite manufacturing industry revenues to more than $3.5 billion in 1994. This represents an increase of 30 percent, while the GNP for the same time period increased by only 6 percent. Satellite manufacturing industry revenues include both space segment and ground equipment revenues. Revenues for the communications satellite manufacturing space segment alone (the communications satellite itself) reached $1.1 billion in 1992, but projections of strong international demand and orders for new domestic broadcasting satellites boosted revenues to $1.9 billion by 1994 and $2.3 billion by 1995. U.S. sales of all satellite ground equipment generated 1993 revenues of $1.6 billion, up 14 percent from 1992.

Although the satellite industry is relatively young . . . it has spawned tens of thousands of jobs.

Combining projected 1994 satellite commercial manufacturing revenues of $3.5 billion and satellite service revenues of $2.3 billion yields satellite industry revenues of $5.8 billion. Thus, the satellite industry makes a significant — and steadily increasing — contribution to the U.S. economy.

Although the satellite industry is relatively young — *Intelsat I* was launched in 1965 — it has spawned tens of thousands of jobs. The space and missile sector of

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9 U.S. Department of Commerce, Office of Telecommunications, *Satellite Communications Industry Update*, February 8, 1996 update (draft), p. 5.

the economy employs 4.56 employees per million dollars of sales.[10] We use that ratio to estimate the employment provided by satellite manufacturing and satellite services. Applying these ratios to projected industry revenues of $5.8 billion translates into approximately 26,000 employees in 1994.

The U.S. had communication satellite exports of $289 million in 1991, $314 million in 1992 and $526 million in 1993. In 1994, exports rose to $549 million, while imports were only $216 million. This published trade data may underestimate the favorable balance of trade, since sales to foreign companies are not included for satellites launched in the U.S. A more realistic figure is provided by the Satellite Industry Association's (SIA's) estimate of exports, based on analysis of satellites launched for international customers (including foreign regional operators and international service providers) and estimated satellite values. That analysis yields export estimates of $950 million in 1994 and $1.1 billion for 1995. Company sales and order information also indicate U.S. leadership of the industry. U.S. manufacturers held orders representing 62 percent of the global market in 1991, 73 percent in 1992, and 69 percent in 1993. In addition, U.S. manufacturers contribute components to virtually all commercial communications satellites manufactured in the world. Statistics indicate a strong increase in exports of U.S.-made parts for communications satellites; parts exports rose from $51 million in 1991 to $130 million in 1994 and had already reached $84 million by the first half of 1995.[11] The latest Commerce Department report indicates that exports of U.S.-made parts for communications satellites to East Asia have expanded by a factor of five over the last three years.[12] U.S. companies were contracted to deliver 12 satellites overseas in 1994 and a record 18 in 1995 to customers in Japan, Mexico, Hong Kong, Luxembourg, Malaysia and Korea, among others. An earlier report indicated U.S.

A more realistic figure is provided by SIA's estimate of exports. . . . That analysis yields export estimates of $950 million in 1994 and $1.1 billion for 1995.

[10] Aerospace Industries Association, "1995 Year-end Review and Forecast," Tables 1 and 9, 1994 data.

[11] *Op. cit., Satellite Communications Industry Update*, p. 1

[12] *Ibid.*

manufacturers are continuing to lead the global market for communications satellites, with orders representing 69 percent of worldwide satellite contracts.

The Department of Commerce predicts an even stronger satellite manufacturing market into the future, with 1996 and 1997 U.S. satellite revenues projected to top $1.7 billion. Revenues will be sustained by U.S. contracts for domestic DBS ventures and for more expensive, more technically sophisticated, follow-on generations for *Intelsat* and *Inmarsat*. The Commerce Department also predicted a large impact on the industry from proposals to use constellations of smaller satellites (smallsats) in low- or medium-earth orbits (LEO or MEO) to provide worldwide personal, portable and mobile telephony. Nine LEO applicants proposed to launch constellations of over 200 smallsats, with total project investments well in excess of $6 billion. In addition, Teledesic has proposed a LEO satellite system which requires more than 800 satellites with development cost estimated at $9 billion.

Actual and potential investment in the satellite industry is large, as discussed above. And, each worker employed in the satellite programs will purchase goods and services that further contribute to the economy (the "multiplier effect"). There are additional indirect, yet equally important satellite industry impacts on the economy. Satellite facilities boost productivity by facilitating business communications in virtually all sectors of the economy. Satellites support existing industries that rely heavily on satellite communications — *e.g.*, cable television, consumer electronics, and data applications. Satellites promote development of innovative new services reliant on satellite communications, and such innovation helps maintain the country's high-tech edge. These secondary effects also translate into U.S. jobs and contributions to the GDP and should be considered when gauging the importance of the satellite industry.

The Commission should look to its past in seeking to craft a solution that meets the public interest at the time — rather than forcing the industry into a Procrustean bed of artificial scarcity and auctions.

D. Regulation of a Growing Industry

The Commission has used a variety of tools to assure that consumers receive technically efficient services from competitive suppliers in the satellite industry. We believe that many more such approaches would be identified with some careful thought. The Commission should look to its past in seeking to craft a solution that meets the public interest at the time — rather than forcing the industry into a Procrustean bed of artificial scarcity and auctions. The Commission should continue to strive to adopt satellite policies that expand output and serve consumer needs, without creating unnecessary risks of negative international impacts.

The FCC and the satellite industry have avoided auctions and all other exclusive choice mechanisms for decades while compiling an enviable record of output growth and innovation. . . . [C]areful thought can accommodate the needs of the satellite industry while benefiting consumers.

The FCC and the satellite industry have avoided auctions and all other exclusive choice mechanisms for decades while compiling an enviable record of output growth and innovation. This section describes some of the causes of this outcome and describes the various approaches the FCC has taken to avoid mutual exclusivity. However, more important than any element on this list is the philosophy behind it — careful thought can accommodate the needs of the satellite industry while benefiting consumers.

The FCC has used several policy tools in the past to accommodate all applicants.

The FCC has used several policy tools in the past to accommodate all applicants. Some of these policy tools are universal (*e.g.*, better technology) and can be applied to any satellite service. Others have proven themselves in specific satellite services and processing rounds in the past; application to other satellite services and processing rounds is unclear.

Five proven policy tools are:

1. **Encouraging better technology**. The FCC's rules have always permitted the satellite industry to adopt more efficient technology and have thus expanded the usable capacity of the orbital arc many times over. Thus, this tradition has allowed the FCC to accommodate more satellite systems and more traffic at any given time.

2. **Expanding the spectrum available to satellite systems.** Historically, the FCC and ITU have expanded the spectrum bands available for use by satellite services. Originally, satellites were restricted to the C-band. Eventually, the Ku-band and the Ka-band were also made available. Today, the L-band and S-band are slated for use by MSS and DARS services. The Commission has had success in encouraging population of the higher-frequency bands. It has also managed to promote bandsharing between satellite and terrestrial systems by constructing rules of operation that accommodate both technologies (*e.g.*, that constrain power output and signal direction).

3. Imposing due diligence milestone requirements on licensees and other policies to deter speculation and warehousing. The FCC has several policies to deter speculation and ensure that satellite licenses are available to serious operators. For example, the imposition of milestone requirements ("use it or lose it" rules) is a proven means of discouraging those who would seek licenses simply in an effort to exploit future scarcity rents. Given the expense of satellite systems, a milestone requirement imposes substantial costs on anyone seeking to hold a purely speculative license. Conversely, a milestone requirement imposes little or no cost on those firms that obtain licenses for the legitimate purpose of actually building and launching a satellite.[13] In addition to discouraging the submission of speculative license applications, the FCC also has used diligence milestones to prevent licensees from warehousing scarce orbital locations with in-orbit satellites that have reached the end of their useful lives.

A complementary approach, which has been deemed appropriate for some kinds of satellite systems, is to authorize systems using a "build and coordinate" rule. . . .

4. Authorizing multiple systems using a "build and coordinate" rule as was done in LEO MSS. A complementary approach, which has been deemed appropriate for some kinds of satellite systems, is to authorize systems using a "build and coordinate" rule — a form of closely-monitored dynamic sharing. Such an approach is currently used for CDMA LEOs. The heart of this approach is to select a set of authorized operators and then establish deadlines for construction and launch. Each authorized operator must disclose its construction progress to the other operators, and all operators must cooperate to develop coordination procedures. Similarly, all operators must employ technology that allows flexible use and sharing of the relevant band. Milestone requirements prevent licensing for speculative purposes. Disclosure requirements permit every firm to better understand the likely frequency sharing and competitive regime they will be entering. Once the satellites are launched, each operator receives a prorated share of the spectrum. A variation of this approach was utilized in both the Big LEO and Little LEO processing rounds.

. . . the applicants developed a means of sharing the available spectrum, thus permitting grant of most of the pending applications.

[13] Because a firm's preferred schedule for building a system may deviate from that imposed by the Commission, there is the possibility that a milestone requirement would impose some costs even on firms that did intend to build satellite systems.